AN ESSAY TOWARD THE "PRIMA PHILOSOPHIA."

The Metaphysics of Nature. By Carveth Read. Pp. viii+354. (London: A. and C. Black, 1905.) Price 7*s.* 6*d.* net.

CRITICAL philosophy or metaphysics Mr. Read divides into two branches, the metaphysics of nature and science and the metaphysics of ideals. In this work he deals only with the former branch, and only with the most general principles of science. He makes it a rule "not to attempt to solve *a priori* any problem that can only be effectually treated by inductive methods." He discusses in the introduction the meaning of terms like belief and knowledge, reality and truth. Then in Book i., entitled "Canonic," he considers various tests of truth, different forms of scepticism, and the great problem of the relativity of knowledge. Book ii.—"Cosmology"—deals with the doctrine of substance. Book iii.—"Psychology"—deals on the same lines with the subject of experience; while the last book—"The Categories"—discusses relation, the physical categories, and the categories of subjective activity.

The author's beliefs on two of the most general of metaphysical problems may be most concisely stated in his own words. Thus on p. 240 he writes:—

> "I am recommending as the most coherent and natural way of thinking, on the whole, this hypothesis that the world is essentially a conscious thing; that in consciousness we have immediate knowledge of Reality, but not of the whole of Being; that the rest of Being is made known to us by phenomena; that it is everywhere conscious, but in various degrees, and that the higher degrees are known to us by the phenomena of organisation."

Again, in dealing with the teleological problem on p. 348:—

> "Frankly, I wish it were possible to prove or make credible the teleology of Nature, because we might then follow Aristotle in identifying the End of Nature with the End of Humanity; but I cannot help feeling that the weight of argument is against the doctrine of Final Causation. Like transcendent Being, it remains a merely indicative, orectic category."

The influences to which Mr. Read most readily responds are Hume, Spinoza, to some extent Spencer, and, of course, modern science. The defences of Hume often bring out points too apt to pass unnoticed. Thus Hume's "custom" is described as "intuitive reason in the making." Mr. Read, who has a lurking affection for the sceptical—*e.g.* he thinks that the scepticism of the new academy was superior, even as philosophy, "to the fanatical dogmatism of the Stoics and to the gaseous hypotheses of the Epicureans"—points out the elements of Hume's philosophy which were clearly sceptical, but lays over against them the facts that scepticism was partly a disguise with Hume, and that even Hume puts forward pragmatism as the natural remedy for scepticism.

Hume's great follower or controverter, Kant, receives interesting treatment. Mr. Read refuses to join in the "hysterical outcry" against the thing-in-itself; but he finds abundant cause for complaint in Kant's mythological method of arguing from the unity of consciousness to a substance, a "thing" that "forms an idea." Kant's famous statement is quoted:—"If there is no *Urwesen* distinct from the world, if the world is without a beginning and therefore without a Creator, if the will is not free, then moral ideals and principles lose all their validity"; and Mr. Read adds, "It is impossible to find in literature a more desperate sentence than this, or a more false."

One welcomes the clear distinctions drawn in the introduction, chapter ii., between empirical, physical, transcendent, and noumenal reality; the defence, too, of much-abused eclecticism on the ground that after all the great systems in philosophy are themselves patchworks. And unless one is wedded to the theory that philosophy must be dull if it is to be sound, one rejoices in the good sayings—often as sensible as they are pungent—with which the book abounds, such as—"Future generations may have reason to thank those who left them something to do, more than those who anticipated everything," or the description of Hegel's rationalism as only an unintelligent empiricism. But no short notice like this can do justice to the closeness of the argument, the soundness and comprehensiveness of a book which must be ranked among the most important of recent years.

There are one or two animalcules in the ointment. Locke's great work is referred to as "Essays of Human Understanding"; and in talking of Hume's "Treatise" the author gives references to the parts only, forgetting that there are in it books divided into parts. Words like *verbile, questionnaire, glissaded,* do not find favour with all readers. An index might well have been provided, but its absence finds much compensation in an excellent table of contents.

MATHEMATICS FOR THE LABORATORY.

Higher Mathematics for Students of Chemistry and Physics, with Special Reference to Practical Work. By Dr. J. W. Mellor. Second edition, enlarged. Pp. xxi+631. (London: Longmans, Green and Co., 1905.) Price 15*s.* net.

THIS is the second edition of a book which from the first was recognised as filling a place of its own in our mathematical literature. It is essentially a book for the student of chemistry, for whom a smattering of mathematics used to be supposed to be sufficient. The result was that our college curricula made no provision for training chemists in the mysteries of the calculus, at least no compulsory provision. When at length the eager student came in touch with modern work, say, on the velocities of reactions, or on thermodynamic developments in general, he encountered mathematical methods and even notations quite unfamiliar to him. What was he to do? Go and quaff the heavenly nectar provided by Williamson or Lamb? But this, we learn from Dr. Mellor's preface, brought perplexity rather than clearness of vision. What the student of chemistry wanted was a working knowledge of the methods of the differential and integral calculus, with a minimum

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of theory and demonstration. The student of physics is somewhat differently circumstanced. From time immemorial physical research and mathematical methods have been more or less closely associated, and every student of physics knew that a certain knowledge of higher mathematics was demanded of him. Yet complaints have been heard even from him that the mathematical courses in our colleges lacked a certain flavour of the real, and were not particularly suited to his needs. It has often been said that there is no royal road to mathematical knowledge. To quote Dr. Mellor himself, a certain amount of drudgery is necessary in some stages. But some roads are easier than others; and in this book chemical and physical problems are introduced, like rest houses along a weary way, to cheer the flagging traveller. Here he finds familiar food for his mind. To change the metaphor, the student is given a new weapon, and at the same time is taught how to use it on material already his.

To what extent the reader, otherwise ignorant of the principles of the differential calculus, will be able to appreciate the first chapter, experience alone can tell. The introduction of sections on proportionality and logarithms in the middle of the discussion of differentiation does not strike one favourably. The author's reference to this in the preface may, however, be accepted as sufficient excuse.

The new edition is fundamentally the same work as the old, but about a fifth more bulky. The increase in size is due partly to a more sparing use of small type, but chiefly to the introduction of new matter. There is also a good deal of re-arrangement of individual sections, such, for example, as the carrying forward of the paragraphs on the Gamma and elliptic functions from chapter iv. (the integral calculus) to chapter vii. (how to solve differential equations). From a physical point of view this is undoubtedly the better arrangement; and there is a further improvement which deserves notice, namely, the leading up to each of these functions by the discussion of a comparatively simple dynamical problem. The most obvious addition is the new chapter on the calculus of variations, in which brachistochrones and isoperimetrical problems are touched upon. Probably the main service rendered by this chapter will be to enlarge the outlook of the student. The class of readers for whom the book is ostensibly written will hardly ever be called upon to apply the calculus of variations, and if they should be they would find the discussion too meagre for them to make effectual use of it; but it is a real service to open a man's mind to the things which lie beyond the immediate purpose of his life. The still too common utilitarian idea that the practical man should be taught just as much mathematics as we know to be necessary for his immediate needs is an idea which cannot be too strenuously contested. The truth is, we never know what will be needed before the year is out. The chemist of the last generation would as soon have thought of studying the properties of Theta functions as of familiarising himself with the modes of solution of the simpler differential equations, or even with the meaning of a differential coefficient; but that attitude of mind is impossible now. The theoretical chemist of the rising generation must know his mathematics, and we are convinced that many will bless Dr. Mellor for providing them with an eminently readable and thoroughly practical treatise.

Throughout the book there are many historic notes which are always interesting in their way. It will not, then, be thought amiss to direct attention to the section on pp. 59 and 60, and to ask why writers are so slow to do Newton justice in regard to his so-called law of cooling. It is now six years since Prof. Crichton Mitchell, in a paper on the convection of heat by air currents (*Trans. R.S.E.*, vol. xl. p. 39), pointed out, what seems to have escaped the notice of every commentator except Fourier, that Newton deliberately placed his cooling body "non in aere tranquillo, sed in vento uniformiter spirante." Dulong and Petit, therefore, and all their copiers, including Dr. Mellor himself, are not giving "a typical example of the way in which the logical deductions of an hypothesis are tested" when they try to apply Newton's law to a body cooling in tranquil air. Crichton Mitchell showed that when Newton's conditions were realised Newton's law held with wonderful accuracy over a considerable range of temperature differences. C. G. K.

PLANT DISEASES.

Minnesota Plant Diseases. By Dr. E. M. Freeman. Pp. xiii+432. (St. Paul, Minnesota: The Pioneer Press.)

THIS publication is issued for "the people of Minnesota" by authority of the university of that State. It may have special reference to a particular State, but it is quite evident, from a perusal of its pages, that the book will be of service wherever plants are cultivated. The author takes a broad view of his subject, and rightly considers the prevention of disease as a more important matter, from the point of view of the cultivator, than the application of remedies. "Agriculture," says he, "really resolves itself into one great problem, the prevention of plant-disease." Keep the "patient" in good health by careful attention to his physiological requirements, by cleanliness and by strict compliance with the teachings of hygiene. Much more good will ensue from these measures than from the use of insecticides or anti-fungus sprays. A knowledge of the life-history of the plant, as well as a corresponding familiarity with the mode of life of the hostile insect or fungus, is, indeed, essential, but unless combined with the faculty of turning that knowledge to account, the information is, practically speaking, of no value.

The first question that is asked when a diseased specimen is submitted is, "What is the matter with this plant?" The next, and in the view of the questioner the most important, is, "What am I to do to get rid of the disease?" Not one in a hundred cucumber-growers, cultivators of the vine or other crops, asks a question as to the methods of preven-

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